Resources Evaluation Newsletter

• Classification • Remote Sensing • Inventory • Analysis •

Copublished and compiled by:
Resources Evaluation Techniques Program
USDA Forest Service
Rocky Mountain Forest and Range Experiment Station
240 West Prospect Street
Fort Collins, Colorado 80526

Copublished and mailing list maintained by:
Division of Resource Inventory Systems
USDI Bureau of Land Management (D-460)
Building 50, Denver Federal Center
Denver, Colorado 80225

REN 3 July 1980

POINT-SAMPLING FACTORS FOR APPALACHIAN HARDWOODS

by
Harry V. Wiant, Jr.[1/]

ABSTRACT

At a given point sample using a BAF=10, the sum of total heights of in-trees in feet times 4.2 provides an estimate of per-acre cubic-foot volume.

A point-sampling board-foot factor (International 1/4-inch Rule) for Appalachian hardwoods has been provided in a previous publication (Wiant and Maxey 1979). Per-acre volume ($V_{bf/a}$) is estimated at a point using an instrument of a given basal area factor (BAF) with the total number of 16-foot logs on "in-trees" (ΣL) by the relation:

$$V_{bf/a} = (\Sigma L)\ (BAF)\ (67)$$

A similar factor is needed for cubic-foot volume.

Procedure and Results

Schnur (1937) provides cubic-foot volume tables, including bark, to 4-inch diameters-outside-bark (dob) for various upland species. Those for white oak (Quercus alba), black oak (Q. velutina), scarlet oak (Q. coccinea), chestnut oak (Q. prinus), northern red oak (Q. rubra), hickories (Carya spp.), red maple (Acer rubrum), yellow-poplar (Liriodendron tulipifera), and black cherry (Prunus serotina) were averaged to produce Table 1. As can be seen in Table 2, cubic-foot folumes varied little between the nine species, as measured by the coefficient of variation (CV, the ratio of the standard deviation to the mean, expressed as a percent), for diameters at 4.5 feet (dbh or D) between 6 and 14 inches and total heights (H) of 40 to 90 feet.

Where data were available for all nine species, ratios of cubic-foot folumes to D^2H were calculated (Table 3). Those ratios did not vary widely in Table 3 (CV = 4.3%). An estimate of cubic-foot volume (V_{cf}), then, is provided by the average of the ratios in Table 3 (.00230), where:

$$V_{cf} = (.00230)\ (D^2H)$$

Cubic-foot volume for each "in-tree" on a per-acre basis ($V_{cf/a}$), using the approach described by Beers (1978), is:

$$V_{cf/a} = (.00230)\ (D^2H)\ (BAF/.005454D^2)$$
$$= (.42)\ (BAF)\ (H)$$

At a given point using a BAF = 10, for example, the sum of total heights of "in-trees" in feet times 4.2 provides an estimate of per-acre cubic-foot volume. If we assume a cord of wood has 90 cubic feet of wood and bark (Avery 1967), the volume in cords per acre ($V_{c/a}$) at a given point is estimated as:

$$Vc/a = (.42)\ (BAF)\ (\Sigma H)/90$$
$$= (.0047)\ (BAF)\ (SH)$$

for BAF = 10,

$$V_{c/a} = (.047)\ (\Sigma H)$$

This relation is surprisingly similar to the one developed by Grosenbaugh (1955) for loblolly pine (.047 versus .05).

[1/] Professor of Forestry, West Virginia University, Morgantown, WV 26506

Table 1. Average cubic-foot volume, including bark, to a 4-inch dob for some Appalachian hardwoods.

	Total height (ft.)									
Dbh (in.)	20	30	40	50	60	70	80	90	100	110
4		0.18	0.54	0.89	1.14					
6	1.50	2.14	2.95	3.71	4.50	5.31	5.74			
8	3.10	4.33	5.87	7.37	8.90	10.47	11.98	12.85		
10		7.2	9.4	11.7	14.1	16.3	18.8	21.2	23.4	
12		11.0	13.5	16.8	20.2	23.5	26.9	30.3	33.9	34.8
14		13.4	18.4	22.9	27.4	32.0	36.7	41.6	46.7	50.3
16			23.0	30.1	35.9	42.3	49.0	56.3	65.0	64.7
18				37.5	45.2	52.7	60.5	67.9	76.5	82.8
20				48.5	57	66	75	84	94	106
22					69	79	90	102	114	128
24						84	101	115	129	160
26								145	168	188
28								168	195	232

Heavy lines indicate limits of Schnur's volume table values for all nine species

Table 2. Coefficient of variation (%) for average cubic-foot volumes for portion of Table 1 with data for all nine species.

	Total height (ft.)						
Dbh (in.)	30	40	50	60	70	80	90
6	10	6	7	8			
8	13	6	6	6	5	5	
10		6	5	5	4	5	5
12		6	5	5	4	5	5
14			5	5	5	4	4
16			13	13	13	15	18

Table 3. Ratios of volume/D^2H for portion of Table 1 with data for all nine species.

	Total height (ft.)						
Dbh(in.)	30	40	50	60	70	80	90
6	.00198	.00205	.00206	.00208			
8	.00226	.00229	.00230	.00232	.00234	.00234	
10		.00234	.00234	.00235	.00233	.00235	.00236
12		.00234	.00233	.00234	.00233	.00234	.00234
14			.00234	.00233	.00233	.00234	.00236
16			.00235	.00234	.00236	.00239	.00244

Average ratio = 0.00230

CV = 4.3%

LITERATURE CITED

Avery, T. E. 1967. Forest measurements. McGraw-Hill Book Co., New York.

Beers, T. W. 1978. Developing efficient estimation techniques for integrated inventories. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station General Technical Report RM-55:270-275.

Grosenbaugh, L. R. 1955. Better diagnosis and prescription in southern forest management. USDA Forest Service, Southern Forest Experiment Station. Occasional Paper 145.

Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. USDA Technical Bulletin 560.

Wiant, H. V., Jr., and W. R. Maxey. 1979. Board-foot factors for point sampling. J. For. 77:29.

* * * * *

DEVELOPMENT OF AN INTERAGENCY NATIONAL SITE (LAND) CLASSIFICATION SYSTEM FOR RENEWABLE RESOURCE ASSESSMENTS

An "Interagency Agreement Related to Classifications and Inventories of Natural Resources" was signed June 6, 1978 by the Bureau of Land Management, Fish and Wildlife Service, Forest Service, and the Soil Conservation Service. Since that time, the Geological Survey has become a party to the Interagency Agreement, and four state organizations are cooperating in the Agreement objectives. The first part of the Agreement provides for coordination of a land classification system. The objectives of the coordinated classification system are to: (1) minimize resource inventory duplication, (2) enhance and encourage data collection and sharing, (3) increase resource assessment/appraisal efficiency and program compatibility, and (4) expedite technology transfer.

A national ecological land classification system has been developed for uniform application for renewable resource inventory, assessment/appraisal, and program planning. This system was proposed by Richard S. Driscoll (Resource Evaluation Techniques Program Manager, Rocky Mountain Station), John W. Russell (Land Management Planning, WO), Marvin C. Meier (Area Planning and Development, WO; current Director, State and Private Forestry, R-10) of the Forest Service at the request of Chief McGuire. This committee received continuing input and review from the cooperating agencies during the development of the system.

The system has four components: vegetation, soil, landform, and water (aquatic). Climate is included as a criteria in the vegetation and soil components. The system provides a class level within each component to satisfy the requirements of different intensities of inventory and planning.

The component classification allows us to deal with each component as an entity. The characteristics of each class are based on primary properties of the components, much like plants and animals are classified taxonomically. The classification system allows data to be cross-referenced among components, or aggregated vertically. This provides flexibility for national, regional, state, or local resources assessments and appraisals for program or project planning and management decisions.

The vegetation component is adapted from the UNESCO System, which is recognized worldwide. It

is based primarily on foliar cover and height of vegetation, and is related to altitudinal, latitudinal, and climatic constraints. The lowest levels of the classification (subformation, series, and association) are comparable to the vegetation classification system used by the Bureau of Land Management, Forest Service, Soil Conservation Service, Bureau of Indian Affairs, and several other agencies.

The soil component is the Soil Taxonomy identified with the National Cooperative Soil Survey in the United States. This system is used by the Departments of Agriculture and Interior and many state and local cooperating agencies. The Soil Taxonomy is designed to classify soils, of the world and is accepted in many countries. Essentially all the soils of the United States have been classified at most levels of the system. Provision has been made to modify definitions or establish new series when necessary.

A new landform component is being developed by a strategy group composed of representatives from each of the five agencies who are cooperating on the Interagency Agreement. The Landform Strategy Group is to consider the morpho metric and genetic approaches to landform classification. The classification of this component should be a taxonomic rather than geographic system. Alternative systems should be ready for testing by fall 1980.

A new water (aquatic) component is nearing completion by an Aquatic Strategy Group represented by each of the five cooperating agencies. The component system is a hierarchical classification of fresh and salt waters as a habitat for life. It is ready for review by the five cooperating agencies.

The classification system is compatible with or based on those used by various agencies, organizations, and individuals. The system can be coordinated with: (1) the classification system used for the 1980 RPA Assessment and RCA Appraisal, (2) Wetland and Aquatic Habitat Classification, (3) regionalizations in Canada and the United States, (4) Utah State University ECOSYM, (5) ECOCLASS-Modified ECOCLASS, and (6) soils and vegetation classification procedures of the Bureau of Land Management and Soil Conservation Service.

During the past three years, the National Site (Land) Classification has been further developed and refined by the Resource Evaluation Techniques Program of the Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, in Fort Collins, Colorado. In January 1979, a technical work group on classification consisting of three members from each of the five cooperating agencies evaluated the system in terms of its usefulness in making site specific resource inventories and national and regional resource assessments. A 1978 field test of the classification was also considered in the review. Based on this technical evaluation, the following are some items endorsed by the cooperating agencies:

1. The concept embodied in the four component system was accepted as a natural land classification system. It is understood that this system does not address all aspects of resource inventory and assessment.

2. The soils component was accepted as presented within the scope of Soil Taxonomy and the National Cooperative Soil Survey.

3. The vegetation component was accepted as presented except:

    a. The UNESCO terminology is to be simplified and the lower two elements are to be further developed taxonomically.

    b. The means for relating current vegetation to the system, either as a separate component or as a part of some other system, must be clearly identified.

    c. National correlation procedures should be developed.

4. Further evaluation of how the classification system relates to mapping procedures, sampling techniques, and component integration was requested to help coordinate it with ongoing inventory and assessment activities.

5. Inventory data collected and analysis processes used by the five agencies shall be translatable into the agreed-upon segments of the classification system in order to maximize technology transfer and data exchange.

6. The Resource Evaluation Techniques Program was instructed to prepare a research publication which describes the classification concept of the system, explains segments of the system that have been accepted, and outlines future research plans. (This publication should be available in the fall of 1980.)

The soil and vegetation components of the classification system can be implemented immediately with little disruption of currently used systems. The landform and aquatic components are being developed. Interagency acceptance and use of the system will establish compatibility among agencies and organizations responsible for resource inventory, evaluation, and assessment/appraisal.

For further information on the National Site (Land) Classification System, contact Daniel L. Merkel, Project Leader, National Site (Land) Classification Project, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, 240 West Prospect Street, Fort Collins, Colorado 80526.

* * * * *

ISTF REACTIVATED

The International Society of Tropical Foresters has been reactivated after a 7 year lapse. Membership is open to professionals having an interest in tropical forestry. Dues are $5 per year and include the ISTF newsletter subscription. For further information contact ISTF, 5400 Grosvenor Lane, Washington D.C. 20014.

* * * * *

FROM DOWN SOUTH

The Southern Station RRE (Forest Survey) unit is about to complete field work on the first comprehensive forest survey of Puerto Rico. Detailed reports on species diversity and timber volume will follow.

Survey units in Southern and Southeastern Experiment Stations are coordinating plans for resource studies in Alabama and Georgia beginning this summer. At the outset, a core set of resource tables will be available and common to both states.

A mid-cycle study of Louisiana Forest resources is planned for Summer 1980. This study will use list sampling, optical bar photography, and ground observations to evaluate timber resource trends and pine regeneration success. For further information contact: Roy C. Beltz, Project Leader, Renewable Resources Evaluation, USDA - Forest Service, Southern Forest Experiment Station, T-10210, U. S. Postal Service Bldg., 701 Loyola Ave., New Orleans, LA 70113.

* * * * *

SITE INDEX CURVES FOR PINUS OOCARPA

The Corporacion Hondurena de Desarrollo Forestal (COHDEFOR) has recently developed site index curves for Pinus Oocarpa for use in Honduras. Two procedures for developing the curves - one from Spain and the other from Chile - were evaluated. For a copy of the procedures and results Spanish, contact: Mr. Cornelio Groothousen, COHDEFOR, Apartado Postal 1378, Tegucigalpa, D.C., Honduras.

* * * * *

CURRENT LITERATURE

Please order directly from sources given in parentheses ( ). For journal articles, contact your local library for availability.

GENERAL

Allen, Gerald M., et al. 1976. Volume tables for small trees in Northern Idaho. Station Note 27. 6p. (Editor, Forest, Wildlife and Range Exp. Stn., Univ. of Idaho, Moscow, ID 83843).

Jacobi, James D. 1978. Vegetation map of the Kau forest reserve and adjacent lands, Island of Hawaii. USDA Forest Service Resource Bull. PSW 16. 1 p.

Evans, Peter A. 1979. Directory of selected forestry-related bibliographic data bases. USDA Forest Service Gen. Tech. Rep. PSW-34. 42 p. (Both from PSW Station, P. O. Box 245, Berkeley, CA 94701).

Hitchcock, Harry C. III. 1980. Provisional biomass statistics for the 201-county Tennessee Valley Region. Tech. Note B-38. 45 p. (Division of Land and Forest Resources, Tennessee Valley Authority, Norris, TN 37828).

1975-1395 - Annales de la Recherche Forestiere au Maroc. 312 p.

1977-1397 - Annales de la Recherche Forestiere an Maroc. Tome 17. 270 p. (Both available from Division de Recherches et D'experimantations Forestieres, Avenue Omar Ben Khattab, B. P. 763, Rabat-Agdal, RABAT, Morocco.)

IMPACT - A bimonthly publication by TVA for those who are interested in natural resource management and the environment of the Tennessee Valley Region. (Contact: Information Services, TVA Office of Natural Resources, Room 201, 401 Building, Chattanooga, TN 37401.)

Stokes, S. L. 1980. Estimation of variance using judgment ordered rank set samples. Biometrics 36(1):35-42.

Lefkovitch, L. P. 1980. Conditional clustering. Biometrics 36(1):43-58.

Goodnight, J. H., and F. M. Speed. 1980. Computing expected mean squares. Biometrics 36(1):123-125.

Garcia Ben, M.S., and V. J. Yohai. 1980. Multivariate analysis of variance in a randomized blocks design when covariance matrices are unequal. Biometrics 36(1):127-133.

Clifford, P., and A. W. Sudbury. 1979. On the use of bounds in the statistical analysis of spatial processes. Biometrics 66(3):495-503.

Tarone, R. E. 1979. Testing the goodness of fit of the binomial distribution. Biometrika 66(3):585-590.

Soil Conservation Society of America (S.C.S.A.). 1979. Sources of native seeds and plants. 7515 Northeast Ankeny Road, Ankeny, IA 50021). 20 p. Price $2.

Galvin, Michael, Kenneth D. Hoover, and Michael L. Avery. 1979. Management of transmission line rights-of-way for Fish and Wildlife. USDI Fish and Wildlife Service, FWS/OBS-79/22: Vol. I. Background information Stock No. 024-010-00520-3. 168 p.; Vol. II. Eastern United States. Stock No. 024-010-00521-1. 347 p.; Vol. III. Western United States. Stock No. 024-010-00522-0. 519 p. (Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.) Price unknown.

1980. The Harvard Computer Mapping Collection: The Standing Library --

Vol. 1. Management's use of maps.

2. Mapping software and cartographic data base

3. Urban, regional, and state applications, plus cadastral systems

4. Computer mapping in natural resources and the environment including applications of satellite derived data

5. Computer mapping in education, research and medicine

6. Thematic map design

7. Management's use of maps - part 2

8. Cartographic and statistical data bases and mapping software

9. Computer graphics hardware

10. Computer mapping of natural resources and the environment including applications of satellite derived data - part 2

11. Urban, regional and state government applications of computer mapping, plus computer mapping in education

(For pricing and availability write Harvard Library of Computer Graphics, Center for Management Research, 850 Boylston St., Chestnut Hill, MA 02167 or phone (617) 738-5020.)

USDA Forest Service. 1980. An assessment of the forest and rangeland situation in the United States. FS-345. 631 p. (Forest Service - USDA, P. O. Box 2417, Washington, DC 20013).

Robbins, M. Kathryn. 1979. How to identify and minimize damage caused by Eutypella Canker of Maple. USDA For. Serv. NA-FR-10. (Northeastern Area State and Private Forestry, 370 Reed Road, Broomall, PA 19008).

Roussopoulos, Peter J., and Robert M. Loomis. 1979. Weights and dimensional properties of shrubs and small trees of the Great Lakes conifer forests. USDA For. Serv. Res. Pap. NC-178. 6 p.

Spencer, John C. Jr., and Arnold J. Ostrom. 1979. Timber resources of Minnesota's aspen-birch unit, 1977. USDA For. Serv. Resource Bulletin NC-43. 52 p.

Laidly, Paul R. 1979. Metric site index curves for aspen, birch and conifer in the Lake States. USDA For. Serv. Gen. Tech. Rep. NC-54. 15 p. (All 3 from North Central Forest Exp. Stn., 1992 Folwell Ave., St. Paul, MN 55108.)

CLASSIFICATION

Tisdale, E. W. 1979. A preliminary classification of Snake River Canyon grasslands in Idaho. Stn. Note 32. 8 p. (Editor, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, ID 83843).

Ducruc, J. P., and Daniel Berube. 1980. Le système de écologique unité de base de la cartographie écologique: l'inventaire du capital nature du territoire de la Baie James. Environment Canada, Ecological Land Classification Series No. 8. 54 p., Cat. No. EN73-3X8F.

Zarnovican, Richard, and Jean-Louis Bélair. 1980. Les tourbieres de la Baie James: La végétation et les sols. Environment Canada, Ecological Land Classification Series No. 9., Cat. No. EN73-9/9F. 37 p.

Taylor, D. G. (ed.) 1980. Land/wildlife integration. Environment Canada. Ecological Land Classification Series No. 11., Cat. No. EN73-3/11, 165 p. (All 3 available from Lands Directorate, Environment Canada, Ottawa, Canada KIA OE7.)

DeGraff, Jerome V. 1979. Regolith classification for land management. Journal of Soil and Water Conservation 34(2): 105-106.

Cowardin, Lewis M., Virginia Carter, Francis C. Golet, and Edward T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. USDI Fish and Wildlife Serv. FWS/OBS-79/31. 103. p. (Office of Biological Services, Fish and Wildlife Service, U. S. Department of Interior, Washington, DC 20240.)

Pfister, Robert D., and Stephen F. Arno. 1980. Classifying forest habitat types based on potential climax vegetation. Forest Science 26:52-70.

Bailey, Robert G. 1978. A new map of the ecosystem regions of the United States. In Proc. Symposium on classification, inventory and analysis of fish and wildlife habitat, Phoenix, AZ. Jan. 24-27, 1977. U. S. Fish and Wildlife Serv. FWS/OBS-78/76. p. 121-128. (Reprint available from the author at Rocky Mountain Forest and Range Exp. Stn., 240 West Prospect St., Fort Collins, CO 80526.)

Forman, Richard T.T., 1979. Pine barrens: ecosystem and landscape. (Academic Press, 111 Fifth Avenue, New York, NY 10003.) 601 p. Price $39.50.

Borman, F. Herbert, and Gene E. Likens. 1979. Pattern and process in a forested ecosystem. (Springer-Verlag New York, Inc., 175 Fifth Ave., New York, NY 10010). 253 p. Price $19.80.

Smalley, G. W. 1979. Classification and evaluation of forest sites on the southern Cumberland Plateau. USDA For. Serv. Gen. Tech. Rep. SO-23, 59 p. (Southern Forest Exp. Stn., Room T-10210, U. S. Postal Services Building, 701 Loyola Ave., New Orleans, LA 70113.)

Smalley, G. W. 1978. Classification and evaluation of forest sites in the Interior Uplands. In P. E. Pope (ed.) Proc. Second Central Hardwood Forestry Conference, Addendum p. Smalley 1-28. Purdue Univ., Nov. 14-16, 1978. (Reprint available from the author at U. S. Forest Service, SPO Box 1290, Sewanee, TN 37375.)

Minor, Don. 1979. Comparative autecological characteristics of northwestern tree species --a literature review. USDA For. Serv. Gen. Tech. Rep. PNW-87. 72 p. (Pacific Northwest Forest and Range Exp. Stn., 809 NE 6th St., Portland, OR 97232).

REMOTE SENSING

Heller, Robert C. 1976. Natural resource surveys. XIII Congress of the International. Society for Photogrammetry 29 p. Reprint.

Ulliman, Joseph J., and Charles R. Hatch. 1978. Test of an electronic planimeter. Journal of Forestry 76(6):346-347. Reprint.

Heller, Robert C. 1978. Case applications of remote sensing for vegetation damage assessment. Photogrammetric Engineering and Remote Sensing. 44(9):1159-1166. Reprint.

Heller, Robert C., and Kim A. Johnson. 1979. Estimating irrigated land acreage from Landsat imagery. Photogrammetric Engineering and Remote Sensing. 45(10):1379-1386. Reprint. (All 4 reprints available from Editor, Forest, Wildlife and Range Exp. Stn., Univ. of Idaho, Moscow, ID 83843.)

Schneider, William G. 1979. Integrated use of Landsat data for state resource management. 677. 36 pages. (Council of State Governments, P. O. Box 11910, Iron Works Pike, Lexington, KY 40578.)

Aldrich, Robert C. 1979. Remote sensing of wildland resources: A state-of-the-art review. USDA Forest Service Gen. Tech. Rep. RM-71. 56 p. (Publications Distribution, Rocky Mt. For. and Range Exp. Stn., 240 West Prospect St., Ft. Collins, CO 80526).

Todd, William J., Dale G. Gehring, and Jon F. Haman. 1980. Landsat wildland mapping accuracy. Photogrammetric Engineering and Remote Sensing 46(4):509-520.

Maxwell, Eugene L. et al. 1980. Monitoring drought impact from Landsat. Executive Summary Report 1951, NASA/Goddard Space Flight Center Contract No. NA55-25081. 36 p. (Contact Earth Resources Department, Colorado State University, Fort Collins, CO 80523 for availability.)

Martinek, Harold, and Alvin Zarin. 1979. The effects of bandwidth compression on image interpreter performance. Tech. Rep. 396. 70 p. (Dept. of Army Res. Inst. for the Behavioral and Social Sciences, 5001 Eisenhower Ave., Alexandria, VA 22333.)

Meeuwig, Richard O., Elwood L. Miller, and Jerry D. Budy. 1979. Estimating pinyon and juniper fuel and biomass from aerial photographs. USDA For. Serv. Res. Note INT-274. 9 p. (Intermountain Forest and Range Exp. Stn., 507 25th St., Ogden, UT 84401.)

INVENTORY

Belt, George H., Jack King, and Everett Bailey. 1974. An instrument system for estimation of evapotranspiration by the eddy correlation method. Stn. Paper 19. 16 p.

Thurow, Thomas L., and Steven R. Peterson. 1978. A preliminary survey of raptorial birds in the Idaho primitive area. Stn. Note 31, 6 p. (both from Editor, Forest, Wildlife and Range Exp. Stn., Univ. of Idaho, Moscow, ID 83843.)

Linn, J. G., and R. D. Appleman. 1980. Feed inventory for dairy cattle. Extension Folder 545, 4 p. (Agricultural Extension Service, University of Minnesota, Minneapolis, MN 55108.)

Litton, R. Burton, Jr., and Robert J. Tetlow. 1978. A landscape inventory framework: Scenic analyses of the Northern Great Plains. USDA Forest Serv. Res. Pub. PSW-135. 83 p. (PSW Forest and Range Exp. Stn., P. O. Box 245, Berkeley, CA 94701.)

Arthur, Louise M., and W. Robert Wilson. 1979. Assessing the demand for wildlife resources, a first step. The Wildlife Society Bulletin, 7(1):30-34.

Herzog, P. W. 1979. Effects of radio-marking on behavior, movements, and survival of spruce grouse. Journal of Wildlife Management 43(2):316-323.

Hitchock, Harry C. 1979. Biomass of southern hardwood regeneration estimated by vertical line sampling. Journal of Forestry 77(8): 474-477.

Mattson, William John, Jr. 1979. Red pine cones, distribution within trees and methods for sampling. Canadian Journal of Forest Research 9(2):257-262.

Patil, S. A., and J. L. Kovner. 1979. On the power of an optimum test for the mean of the inverse gaussian distribution. Technometrics 21(3):379-381.

Zasada, John C., and Roseann Densmore. 1979. A trap to measure Populus and Salix seedfall. Canadian Field Naturalist. 93:77-79.

Burnham, K. P., and W. S. Overton. 1979. Robust estimation of population size when capture probabilities vary among animals. Ecology 60(5):927-936.

Heckel, David G., and Jonathan Roughgarden. 1979. A technique for estimating the size of lizard populations. Ecology 60(5):966-975.

Erickson, Paul A. 1979. Environmental impact assessment, principles and applications. (Academic Press, 111 Fifth Ave., New York, NY 10003.) Price $26.

Grigal, D. F., and N. R. Moody. 1980. Estimation of browse by size classes for snowshoe hare. Journal of Wildlife Management 44(1): 34-40.

White, Gary C., and Lester E. Eberhardt. 1980. Statistical analysis of deer and elk pellet-group data. Journal of Wildlife Management 44(1):121-131.

McCaughran, Donald A., and Robert Jeffery. 1980. Estimation of the audio index of relative abundance of band-tailed pigeons. Journal of Wildlife Management 44(1):204-209.

Barret, Gerald A., and Donald H. Rush. 1980. Comparison of neckbands and patagial tags for marking American coots. Journal of Wildlife Management 44(1):236-241.

Kolz, A. L., and Richard E. Johnson. 1980. Self-adjusting collars for wild animals equipped with transmitters. Journal of Wildlife Management 44(1):273-275.

Major, Michael et al. 1980. Identifying scats by recovery of bile acids. Journal of Wildlife Management 44(1):290-293.

Darroch, J. N., and D. Ratcliff. 1980. A note on capture-recapture estimation. Biometrics 36(1):149-153.

Good, I. J., et al. 1979. Population estimation by the removal method assuming proportional trapping. Biometrika 66(3):485-494.

Ramsey, F. L. 1979. Parametric models for line transect surveys. Biometrika 66(3):505-512.

Hamilton, David A., Jr. 1979. Setting precision for resource inventories. Journal of Forestry. Oct. 1979. 667-670. Reprint.

Norum, Rodney A., and William C. Fisher. 1980. Determining the moisture content of some dead fuels using a microwave oven. USDA For. Serv. Res. Note INT-277. 7 p. (both from Intermountain Forest and Range Exp. Stn., 507 25th St., Ogden, UT 84401.)

Alban, David H. 1979. How to estimate red pine site index. USDA For. Serv. 1 p. (North Central Forest Exp. Stn., 1992 Folwell Ave., St. Paul, MN 55108.)

ANALYSIS

Hanley, Donald P. 1976. Tree biomass and productivity estimated for three habitat types of northern Idaho. Bulletin 14, 15 p.

Johnson, Leonard R. 1979. Quantities and costs of wood biomass in Idaho. Bulletin 30, 10 p.

Belt, George H. 1980. Predicting stream flow changes caused by forest practices using the equivalent clearcut area model. Bulletin 32. 11 p. (Order all 3 from Editor, Forest, Wildlife and Range Exp. Stn., Univ. of Idaho, Moscow, ID 83843.)

Madgwick, H. A. I., and R. E. Kreh. 1980. Biomass estimation for Virginia pine trees and stands. Forest Science 26:107-111.

Waring, R. H., and W. G. Thies, and D. Muscato. 1980. Stem growth per unit of leaf area: a measure of tree vigor. Forest Science 26:112-117.

Clutter, Jerome L. 1980. Development of tape functions from variable-top merchantable volume equations. Forest Science 26:117-120.

Ek, Alan R., and Robert A. Monserud. 1979. Performance and comparison of stand growth models based on individual tree and diameter-class growth. Canadian Journal of Forest Research 9(2):231-244.

Cao, Quang V., Harold E. Burkhart, and Timothy A. Max. 1980. Evaluation of two methods for cubic volume prediction of loblolly pine to any merchantable limit. Forest Science 26:71-80.

Fahey, Thomas D. 1980. Grading second-growth, Douglas-fir by basic tree measurements. Journal of Forestry 78(4):204-206.

McMinn, James W. 1980. Total-forest concept in multiresource management. Journal of Forestry 78(4):208-210.

Sinden, John A., and Albert C. Worrell. 1979. Unpriced values: Decisions without market prices. (John Wiley and Sons, Inc., 605 Third Ave., New York, NY 10016.) 511 p. Price $25.95.

Knight, Herbert A., and Joe P. McClure. 1979. South Carolina forests. USDA For. Serv. Resource Bulletin SE-51. 66 p.

Boyce, Stephen G., and Herbert A. Knight. 1979. Prospective ingrowth of southern pine beyond 1980. USDA For. Serv. Res. Pap. SE-200. 50 p. (both from Southeastern Forest Experiment Station, P. O. Building, Box 2570, Asheville, NC 28802.)

Russell, Robert M., and Jacqueline L. Robertson. 1978. Programming profit analysis. ESA Bulletin 25(3):191-192. Reprint.

Jansen, Henricus C. 1976. Range Ram - a long term planning method for managing grazing lands. USDA For. Serv. Res. Paper PSW-120. 15 p. (both from PSW Forest and Range Exp. Station, P. O. Box 245, Berkeley, CA 94701.)

Caldwell, Patrick J. 1980. Primary shaft measurements in relation to age of sharp-tailed grouse. Journal of Wildlife Management 44(1):202-204.

Coe, Robert J., Robert L. Downing, and Burd S. McGinnes. 1980. Sex and age bias in hunter-killed white-tailed deer. Journal of Wildlife Management 44(1):245-249.

Tait, D. E. N., and F. L. Bunnell. 1980. Estimating rate of increase from age at death. Journal of Wildlife Management 44(1):296-299.

Massie, M. R. C., J. Rudd, and G. H. Manning. 1979. ECON-Financial evaluation module for tree growth simulators. BC-X-187. 10 p. (Pacific Forest Research Center, 506 W. Burnside Road, Victoria, B. C., Canada V8Z 1M5.)

Taft, Kingsley A., Jr., and Stanford E. Davis. 1978. Integrated forest wildlife management through graphical analysis. Paper FFF/8-2, Eighth World Forestry Congress, Jakarta, Indonesia. (From Stanford Davis, Tennessee Valley Authority, Div. of Land and Forest Resources Norris, TN 37828.)

Farrell, John P., and Lawrence M. Potash. 1979. A comparison of alternate formats for the portrayal of terrain relief on military maps. Tech. Rep. 428. 58 p.

Blum, R. et al. 1979. Information management for the tactical operations systems (TOS). Res. Rep. 1228. 20 p.

Mace, Douglas J., Paul C. Harrison, Jr., and Edmond L. Seguin. 1979. Prevention and remediation of human input errors in ADP operations. Tech. Rep. 395. (All 3 from Dep. of Army Res. Inst. for the Behavioral and Social Sciences, 5001 Eisenhower Ave., Alexandria, VA 22333.)

Hunter, Dennis H. 1979. Multiresource simulation for wildland management. Environmental Management 3(6):535-552.

Miyata, Edwin S. How to calculate costs of operating logging equipment. USDA For. Serv. 1 p. (North Central Forest Exp. Stn., 1992 Folwell Ave., St. Paul, MN 55108.)

* * * * *

MEETINGS, WORKSHOPS, AND SYMPOSIA

July 21-23, 1980. Watershed Management Symposium. (Red Lion Motel, Boise, Idaho.) Contact: ASCE, 345 East 47th St., New York, NY 10017. Phone (212) 644-7496.

July 21-25, 1980. Multilevel Sampling Designs for Resource Inventories. $400. Contact: Offices of Conferences and Institutes, W1 Rockwell Hall, Colorado State University, Ft. Collins, CO 80523. Phone (303) 491-6222.

July 21-25, 1980. International Conference on Soil Conservation. Contact: Mrs. P. M. King, National College of Agricultural Engineering, Silsoe, Bedford, England MK45 4DT.

July 31-August 2, 1980. Symposium on Hazard Rating Systems in Forest Insect Pest Management. (Athens, Georgia). Contact: Dr. Roy L. Hedden, Program Chairman, Dept. of Forestry, Clemson University, Clemson, SC 29631.

August 2-22, 1980. Remote Sensing of Natural Resources. Summer intensive Course 5150. Contact Dr. Roy A. Mead, Dept. of Forestry, School of Forestry and Wildlife Resources, Cheatham Hall, Virginia Tech., Blacksburg, VA 24061. Phone (703) 961-5482.

August 18-20, 1980. Forest Management Planning: Present Practice and Future Direction. $30. Sponsored by IUFRO. Contact: William A. Leuschner, School of Forestry and Wildlife Resources, VPI and State University, Blacksburg, VA 24061. Phone (703) 961-5484.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DENVER FEDERAL CENTER
BUILDING 50
DENVER, COLORADO 80225

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
U. S. DEPARTMENT OF THE INTERIOR
Int 415